PARABOLIDA AND HALF TUBES BAFFLE BLOCK PERFORMANCE TO REDUCE OF LENGTH ENERGY FLOW, AND HYDRAULIC JUMP ON USBR TYPE II STILLING BASIN.

FINAL PROJECT

Requirements reached bachelor
degree of S-1 Civil Engineering

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CIVIL ENGINEERING DEPARTMEN
ENGINEERING FACULTY
UNIVERSITAS MUHAMMADIYAH SURAKARTA

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CERTIFICATION SHEET

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Final Project

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Surakarta, July 2016

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Bismillahirrahmannirrahim

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Declare that this Final Project is made and presented by mine, except the quotations and summaries that I have explained from all of the sources. If at a later it is found that this Final Project is a product of plagiarism, I am willing to accept any legal consequence that may be imposed to me.

Surakarta, June 2016

Person responsible

Muhammad Yogi Prasetyo.

MOTTO

"And whoever fears Allah – He will make for him a way out and will provide for him from where he does not expect. And whoever relies upon Allah – then He is sufficient for him. Indeed, Allah will accomplish His purpose. Allah has already set for everything a [decreed] extent." [Qur'an, 65: 2-3]

"Indeed, Allah will not change the condition of a people until they change what is in themselves." [Qur'an, 13:11]

"Yesterday I was clever, so I wanted to change the world. Today I am wise, so I am changing myself." – Rumi

"Then when you have taken a decision, put your trust in Allah." [Qur'an, 3:159]

"None of you truly believes (in Allah and His religion) until he loves for his brother what he loves for himself." [Sahih Bukhari and Muslim]

"There are two blessings which many people lose: (They are) health and free time for doing good." [Sahih Bukhari]

"After asking Allah to guide you to the straight path, don't just stand there … start walking!" – Albaz Poetry

PREFACE

Assalamu'alaikum Wr. Wb.

Alhamdulillah, all praise to Allah azza wa jalla who has given blessing and mercies until this Final Project can be completed. This Final Project to complete most the requirement to achieve S-1 graduate degree in Civil Engineering Department, Engineering Faculty, Universitas Muhammadiyah Surakarta. The author also says thanks for all parties who give any support for arrangement this Final Project until it can be completed.

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The author realize that the arrangement this Final Project is not a perfect one. Because of that, the author hope there are any suggestion and criticism to make this Final Project better and can be useful for us. Aamiin

Wassalamu`alaikum Wr.Wb.

Surakarta, July 2016

Author

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF NOTATION

A : Wide Surface Flow (cm^2)

b : Wide Channel (cm)

Cd : Discharge Coefficient

Ce : Coefficient Surface Flow

E : Energy (cm)

Fr : Froude Number

g : gravitation (cm^2/s)

d1 : Upstream Depth (cm)

d2 : Downstream Depth (cm)

Hd : Depth Top of Crest (cm)

hf : energy Loss(cm)

Lj : Length of Hydraulic (cm)

P : Height of Weir (cm)

Q : Discharge (cm^3/s)

R : Stilling Basin Radius (cm)

Re : Reynolds Number

V : Velocity Flow (m/s)

V1 : Velocity Upstream (m/s)

V2 : Velocity Downstream (m/s)

υ : Viscosity kinematic (m^2/s)

Θ : Angle (o)

W : Weight (kg)

γ : Specify Gravity (kg/cm3)

So : Angle Slope Channel

ymax : Length of Hydraulic (cm)

F : Force (N)

PARABOLIDA AND HALF TUBES BAFFLE BLOCK PERFORMANCE TO REDUCE OF LENGTH ENERGY FLOW, AND HYDRAULIC JUMP ON USBR TYPE II STILLING BASIN.

ABSTRACT

Scouring that occurs downstream of the stilling basin weir respective common. stilling basin scour downstream of the weir will cause damage not only to the base and the river bank, but also can damage the floor of the stilling basin weir, so it could damage the structure of the weir, so the age of the weir is not in compatible with the age of the plan. Stilling basin scouring on downstream is caused by several factors such as the energy flow and the height of the flow rate. The presence of hydraulic jump planned in stilling basin of the weir actually can reduce the flow of energy, but the real reality on the ground is still occur scouring downstream stilling basin.

This study determine to know baffle block performance types parabolaida (parabolic three-dimensional) and baffle block half tube to reduce the energy flow of water and reduce the length of hydraulic jump. With presence of the reduction energy flow and the length of hydraulic jump, the water hazard scouring downstream weir can be reduced significantly, so that damage the base and the cliffs of channels (streams) or damage stilling basin weir on stilling basin can be avoided.

This research was conducted using the open channel flow flume facility in the Department of Civil Engineering, Faculty of Engineering UMS, the flume length of 10m, width of 60 cm and a maximum discharge of flow of 6000 cm^3/s. Ogee spillway weir design using an stilling basin USBR type II and shaped of baffle block design parabolaida and half tubes. Baffle blocks placement in two layers and placed in 3 place on the stilling basin of the weir, at the 1/3 beginning, middle, 1/3 the end of stilling basin of the weir. The discharge that use varies from 3500 cm^3/s - 6000 cm^3/s (as many as 6 variations of discharge). Baffle blocks performance to reduce the energy and length hydraulic jump of water use the ogee

spillway and stilling basin USBR II (without baffle block). From the comparison we can conclude effectively shape of baffle block and baffle blocks placement most optimal to reduce the energy flow water and the length of hydraulic jump.

Key words: *Parabolida baffle block, Half tubes baffle block, Hydraulika, Reduce Energy Flow, Hydraulic Jump, Stilling Basin USBR Type II.*

ABSTRACT

Gerusan yang terjadi di hilir kolam olak suatu bendung masing sering terjadi. Gerusan kolam olak dihilir bendung ini akan menyebabkan kerusakan tidak saja pada dasar dan tebing sungai, akan tetapi juga dapat merusakkan lantai kolam olak bendung, sehingga dapat merusakkan struktur bendung, sehingga umur bendung tidak sesuai dengan umur rencananya. Gerusan di hilir kolam olak disebabkan oleh beberapa faktor antara lain faktor energi aliran, dan kecepatan aliran yang masih tinggi. Adanya loncatan air yang direncanakan di kolam olak suatu bendung di satu sisi dapat meredam energi aliran, akan tetapi kenyataan real di lapangan masih terjadi gerusan di hilir kolam olak.

Penelitian ini berusaha mengetahui unjukkerja dari *baffle block* jenis parabolaida (parabola 3 dimensi) dan *baffle block* setengah tabung untuk meredam energi aliran, maupun meredam panjang loncat air. Dengan adanya peredaman dari energi aliran, serta panjang loncat air maka bahaya gerusan di hilir bendung dapat direduksi secara signifikan, sehingga kerusakan dasar dan tebing saluran (sungai) maupun kerusakan lantai kolam olak bendung dapat dihindari.

Penelitian ini dilakukan dengan menggunakan fasilitas flume aliran saluran terbuka di Jurusan Teknik Sipil Fakultas Teknik UMS, dengan panjang flume 10m, lebar 60 cm dan debit maksimum 5000 cm^3/dt. Desain bendung menggunakan pelimpah ogee dan kolam olak tipe USBR tipe 2 dan desain *baffle block* berbentuk parabolaida serta setengah tabung. Susunan *baffle block* disusun secara 2 lapis dan diletakkan di 4 tempat pada lantai kolam olak, yaitu pada kaki bendung (awal kolam olak), sepertiga awal kolam olak, tengah-tengah kolam olak dan duapertiga kolam olak. Debit yang dipergunakan debit yang bervariasi dari 3500 cm^3/dt – 5000 cm^3/dt (sebanyak 4 variasi debit). Unjukkerja *baffle block* untuk meredam energi dan panjang loncat air dibandingkan dengan unjukkerja bendung pelimpah ogee serta kolam olak USBR tipe 2 (tanpa baffle block). Dari perbandingan tersebut dapat disimpulkan jenis baffle block dan susunan *baffle block* yang paling optimal untuk meredam energi aliran, serta meredam panjang loncat air.